

Paper #7-10

COMMUNICATIONS SOLUTIONS IN THE ARCTIC

Prepared for the
Technology & Operations Subgroup

On March 27, 2015, the National Petroleum Council (NPC) in approving its report, *Arctic Potential: Realizing the Promise of U.S. Arctic Oil and Gas Resources*, also approved the making available of certain materials used in the study process, including detailed, specific subject matter papers prepared or used by the study's Technology & Operations Subgroup. These Topic Papers were working documents that were part of the analyses that led to development of the summary results presented in the report's Executive Summary and Chapters.

These Topic Papers represent the views and conclusions of the authors. The National Petroleum Council has not endorsed or approved the statements and conclusions contained in these documents, but approved the publication of these materials as part of the study process.

The NPC believes that these papers will be of interest to the readers of the report and will help them better understand the results. These materials are being made available in the interest of transparency.

The attached paper is one of 46 such working documents used in the study analyses. Appendix D of the final NPC report provides a complete list of the 46 Topic Papers. The full papers can be viewed and downloaded from the report section of the NPC website (www.npc.org).

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Topic Paper

(Prepared for the National Petroleum Council Study on Research to Facilitate Prudent Arctic Development)

7-10	Communications Solutions in the Arctic	
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SUMMARY Northern Alaska telecommunication capabilities currently include , constraints and technological recommendations for the future to support Alaskan Arctic OCS explorations and development.		

PURPOSE

To provide information on the demand for telecommunications services and bandwidth to facilitate the technological requirements of today’s resource developments, and the social and economic needs of communities (education and Health Services) served.

BACKGROUND/ONGOING RESEARCH

There are three primary telecommunications transport methods being utilized in northern Alaska. These telecommunications facilities or infrastructure make up the backbone of the connections to the main communication centers in Alaska and the rest of the US.

- Satellite - The primary means of transport to the outside world throughout the communities of the Arctic and the OCS, with the exception of the Prudhoe Bay operating area and its associated pipeline corridor. Satellite technology is the primary means of telecommunication transport for the local phone companies, and remote facilities of the resource exploration projects, including the offshore activities. Satellite technologies have improved at a tremendous rate, analogous to the cell phone becoming a smart phone, and satellite capabilities and bandwidth efficiencies have kept pace with demand, which have enhanced and delivered quality services to the exploration offshore activities and will continue to do so.

- Point to Point Radio (Microwave) - supports the extension of the footprint of services from the Satellite earth station or fiber optic facilities to areas requiring telecommunication services. This is generally referred to as “last mile connectivity”, however where other infrastructure (Roads and Power) are available it may be utilized for long haul transport. For example, the Alyeska Pipeline supports such a system.
- Fiber Optic Connectivity - Currently this method is available via the Pipeline corridor and supports the Prudhoe Bay operating areas with much greater capacities and speed to satisfy the increasing technological demands for telecommunication services.

Outside the Prudhoe Bay operating area Fiber connectivity does not currently exist, nor does extensive backbones of Microwave radio systems. The communities are not linked together due to the large expanses of geography between them and the lack of infrastructure (Power, Roads) to make these connections feasible, therefore the satellite earth station is the primary telecommunications infrastructure. Off shore, the Satellite (VSAT) technologies supply untethered IT capabilities that are required in a moving marine environment, and the VSAT does so with ever increasing efficiencies.

DISCUSSION/POTENTIAL AREAS OF FURTHER RESEARCH

Which technology is utilized in these more remote areas is dependent on many criteria, economics, time (duration of the telecom requirements), availability of infrastructure (power utilities) and transport methods (road, marine, aircraft) for accessing the area.

- The life cycle of the telecommunication/IT requirement generally has strong influence on technologies utilized and the investments made to satisfy either the long term or short term needs. As infrastructure develops in a community or demands from a resource development project increase the telecommunications technologies deployed will become more robust and reliable.
- These technologies require forethought and planning as construction cycles are long in the Arctic, very seasonal, and with short windows of opportunities to accomplish physical construction and implementation of telecommunication facilities. This timing constraint is profoundly evident in the offshore drilling where Weather, Ice, and Regulation dictate a short seasonal cycle(100 days or less), and robust and redundant VSAT systems are deployed for reliable delivery and safe operations.

The Telecommunications Industry has strived to provide “ubiquitous” services throughout the US and the world, and the technologies deployed have for the most part delivered this and become what we expect in today’s world.

- The current communications infrastructure in the Arctic does not integrate well into this modern broadband world as the infrastructure to support them is limited (exception-Prudhoe Bay OA), and the opportunities for further development of Telecommunication facilities (Fiber Optic connectivity, Long hall Microwave networks) are economically challenging and require significant infrastructure to support.
- The efficient integration of these technologies linking the Arctic communities to each other and resource projects to the broadband world are challenged not only by regulatory and fiscal constraints, but also by physical constraints of the arctic environment.

Key considerations for improvement include:

- Power. A subject by itself, but telecommunications facilities require power (sustained, and reliable) for both permanent (long term) and temporary (seasonal/short term) requirements.
 - When there is a requirement for facilities to link projects or communities in the Arctic that span vast amounts of geography, the ability to provide sustained power at remote sites (relay/repeater towers etc) is usually the show-stopper for the development of such a system. The ability to provide sustained power is not feasible without infrastructure (roads and/or utilities).
- Transportation Corridors. Significantly aid in the development of communication facilities, a good example being the Prudhoe Bay OA.
 - These corridors generally lead to and connect to the facilities requiring telecommunication services, and these facilities meet the sustained power requirement as well.
 - Corridors also ease access requirements for the construction and deployment of the various telecommunication technologies and facilities.
 - Corridors generally are a pathway for utility distribution (power, and telecommunications)
 - Corridors generally indicate long term requirements versus seasonal or temporary activities.
- All three Telecommunication transport methodologies described above have similar and unique environmental hurdles in the Arctic.
 - Fiber Optic cable, being the least mature in its application and deployment in both the Arctic waters and terrestrially across lands of permafrost, provide for unique challenges.
 - Microwave and Satellite have similar issues terrestrially, but have been dealt with and engineered for many years, however they both have technological issues unique to the Arctic as well to include electromagnetic variations affecting performance, more pronounced sun spot outages, and satellite grazing (look) angles.

- Satellite usage off shore, especially as we operate in the far northern latitudes, begins to degrade in its reliability(up time) due to extreme low look angle to the satellite itself.
- Satellite low look angle and the ever present fog (high moisture) effects signal efficiencies (degradation of through put), although somewhat rare when it happens there is little that can be done about it.
- The Arctic is only supported by a few satellites that have spot beams (footprints) that provide coverage. Generally the Arctic is on the outer edge of these coverage areas and this limits available bandwidth both technologically and the number of satellite transponder providers. Transponder coverage also affects the satellite antenna size utilized on the vessels and as this coverage improves the ability to utilize smaller antennas (dishes) becomes feasible; important where precious deck space is typically an issue.

While these challenges present a few of the obstacles facing the provisioning of the integrated telecommunications model “ubiquitous services” there is movement towards solutions on the horizon. Several Telecommunications providers are promoting plans to extend services from Anchorage and Fairbanks to the Arctic coast. One provider has extended their Fiber network from Anchorage to Alaska’s west Coast (Bristol Bay) and extended its broadband services further up the west coast utilizing long hall microwave facilities to Kotzebue. Others are planning to lay Fiber optic cables up the west arctic coast and across the NW passage.

The satellite industry continues to make significant improvements in both the availability of spectrum and the technologies to facilitate maximizing the amount of information that can be transferred. VSATs today provide the ability to supply real time information from offshore operations such as real time drilling information, operational video, etc., while simultaneously delivering voice (telephone), data and internet functionality safely and with unprecedented reliability. In the not too distant past a couple of 64kbps circuits for telephone and facsimile were a luxury to operators. Today’s VSAT delivers upwards of 2-3Mbps of bandwidth/throughput, and as spectrum and coverage in the Arctic increase we can expect the VSAT technologies to deliver an ever increasing amount service supporting the technological demands of modern exploration activities safely and efficiently.

RECOMMENDATIONS

Enhanced telecommunications capabilities in northern Alaska would benefit from:

- The availability of the broadband services.
 - The development of these telecommunication facilities will link communities and bring the necessary broadband bandwidth to enable them to participate in capabilities similar to the rest of the US.

- Economically. The development of a suitable Telecommunications infrastructure will require a “coordinated (Industry, Federal, State and Local) investment decisions”.
- Prudent investment in Arctic Telecommunication Solutions will provide the linking of communities across the Arctic coast to the broadband networks in Anchorage and the rest of the US.
 - The Arctic Telecommunications challenge provides opportunities to Industry, Federal, State and Local Governments and Academia to develop, test, and utilize modern, cutting edge and exploratory technologies.
 - This investment would enhance operational safety during exploration and development phases of OCS oil and gas activity and the peoples of Alaska while enhancing the protection of the Arctic environment.

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